# EXHIBIT A

**UNITED STATES BANKRUPTCY COURT**

**SOUTHERN DISTRICT OF NEW YORK**

| | |
|---|---|
| In re: | Case No. 19-23649 (RDD) |
| PURDUE PHARMA, L.P., et al., [1] | Chapter 11 |
| Debtors. | Jointly Administered |

# AMENDED EXPERT REPORT OF

# CHARLES D. COWAN, Ph.D. and SEAN T. MALONE, Ph.D.

Amended July 5, 2021
San Antonio, TX

[1] The Debtors in these cases, along with the last four digits of each Debtor's registration number in the applicable jurisdiction, are as follows: Purdue Pharma L.P. (7484), Purdue Pharma Inc. (7486), Purdue Transdermal Technologies L.P. (1868), Purdue Pharma Manufacturing L.P. (3821), Purdue Pharmaceuticals L.P. (0034), Imbrium Therapeutics L.P. (8810), Adlon Therapeutics L.P. (6745), Greenfield BioVentures L.P. (6150), Seven Seas Hill Corp. (4591), Ophir Green Corp. (4594), Purdue Pharma of Puerto Rico (3925), Avrio Health L.P. (4140), Purdue Pharmaceutical Products L.P. (3902), Purdue Neuroscience Company (4712), Nayatt Cove Lifescience Inc. (7805), Button Land L.P. (7502), Rhodes Associates L.P. (N/A), Paul Land Inc. (7425), Quidnick Land L.P. (7584), Rhodes Pharmaceuticals L.P. (6166), Rhodes Technologies (7143), UDF LP (0495), SVC Pharma LP (5717) and SVC Pharma Inc. (4014). The Debtors' corporate headquarters is located at One Stamford Forum, 201 Tresser Boulevard, Stamford, CT 06901.

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## I. Executive Summary

1. The Office of the Attorney General for West Virginia retained Analytic Focus LLC to perform the following activities. First, we were asked to review the multitudinous allocation models considered by the ad-hoc committees of the consenting and non-consenting states ("the Multi-State Group")[1]. These different plans[2] were patched together to compute allocation shares for the National Opioid Abatement Trust (NOAT), as shown in Schedule C of Purdue's plan for reorganization. We were asked to evaluate how these allocation models reflected state and territory needs for abatement resources.

2. Further, we were asked to develop an alternative allocation model that better represents the needs for abatement resources. We do this by determining which factors to consider in the allocation, why certain factors must be considered, and the key problems with the current proposed allocation.

3. Two key issues informed our review of the NOAT plan and the individual plans that feed this agglomeration and our development of an alternative allocation plan:

   i. Basic economics dictates that the greater the intensity of a problem, the more expensive the treatment. If the severity is greater, causing more problems for the patient, this leads to possible co-morbidities that would not be present

[1] Many documents that we were asked to review that contained information about the various allocation models discussed within this report are withheld due to common interests. In this report, we make references to some of these documents. We refer to these as numbered documents with the prefix "CONFIDENTIAL-" (e.g., "Confidential-1.pdf" or "Confidential-2.xlsx").

[2] These allocation models include the Denver Plan, New Mexico Plan, Vermont Plan, and the Multi-State Group's Plan.

otherwise. In the same way, the time to recovery or abatement of the problem is greater. It is simply common sense that intensity should be a factor in allocation of resources to states.

ii. A population based allocation is one that rewards states for numerosity in terms of population count, but disregards factors such as the need for a greater infrastructure to deal with more intense problems, the need for more time for expenditures to continue to deal with more intense problems, and the rippling impact on other parts of a local or state government. This would include demands placed on the criminal justice system, on safety nets, and on the welfare system that result from more intense problems.

4. Based on our analysis, it is our opinion that:

- The National Opioid Abatement Trust allocation largely ignores the importance of the varying levels of intensity of the opioid epidemic among the states.
- The National Opioid Abatement Trust allocation places too much weight on the general population count of states instead of counts that reflect the intensity of the opioid epidemic and the consequent impacts on state expenditures.
- For the majority of the fund allocation, the NOAT allocations rely on a model that uses multiple sets of rules to allocate funds, including one for the small-hardest-hit states, one for small states, one for California, and one for the remaining states and territories.
- The NOAT allocations rely on a complicated combination of these different rule sets, some of which overlap with one another and are duplicative. Other than political expediency, there is no guiding principle that leads to an allocation that helps resolve the opioid crisis.

- An alternative allocation, the Greater Intensity Adjusted Model takes a more reasonable approach by significantly reducing the complexity of allocation rules and provides a compromise on the weighting of intensity. Both of these features make the allocation shares more equitable to the states and territories in terms of allocation shares matching needs for abatement resources.

5. This report summarizes analyses we conducted and the conclusions we developed based on these analyses. The materials on which we relied for this report are listed in Exhibit 1. We reserve the right to amend this report should new information become available.

## II. Professional Qualifications and Compensation for Charles D. Cowan, Ph.D.

6. Dr. Cowan has over forty years of experience in statistical research and design. He received his Bachelor of Arts degree in Economics from the University of Michigan, his Master of Arts degree in Economics from the University of Michigan, and his doctorate in Mathematical Statistics from the George Washington University. He currently consults for numerous public and private sector entities on the design, implementation, and evaluation of research, and the synthesis of statistical and sampling techniques for measurement. His professional experience and academic tenure are included in his curriculum vitae, a true and correct copy of which is attached as Exhibit 2.

### Professional Experience

7. He has designed numerous large and complex research programs. These include the Post Enumeration Program for the U.S. Census Bureau to evaluate the Decennial

Census, the Economic Cash Recovery valuations conducted by the Resolution Trust Corporation ("RTC"), and evaluation studies conducted for the Department of Justice, the Department of Defense, and the Department of the Treasury.

8. From January 2002 to the present, He have been a Member of Analytic Focus LLC. My firm provides analytic services in the public and private sectors. My firm has multiple projects with the federal government involving audits and other review services. The firm helps businesses and nonprofits optimize their operations and estimate the economic impact of their activities. Included in the firm offerings are expert witness and consulting services in litigation. A list of cases in which he has given expert testimony during the previous four years is attached as Exhibit 3.

**Experience in Academia**

9. He has taught graduate and undergraduate courses in sampling theory, statistics, and computational methods for analysis. He recently retired from his position as Professor in the School of Public Health at the University of Alabama at Birmingham.

10. He also served as an Associate Professor of Statistics at George Washington University from 1993 to 1998, and served as a Visiting Research Professor at the Survey Research Laboratory of the University of Illinois from 1983 to 1989.

**Publications**

11. He has co-authored two books: one on evaluation of survey and census methods, and one on econometric measures related to the welfare of the U.S. economy. He also has written numerous articles on statistical methods, sampling, rare and elusive

population research, and optimization techniques. A listing of these publications is included at pages 4 to 7 of his curriculum vitae, attached as Exhibit 2.

**Professional Societies**

12. He is a member of the American Statistical Association and has held memberships in other professional societies. His positions on professional committees are listed at page 3 of his CV, attached as Exhibit 2.

**Compensation**

13. He is being compensated for his work on this engagement at the rate of $525 per hour for his time. The payment of his fees is not contingent on the opinions he expresses in connection with this engagement.

## III. Professional Qualifications and Compensation for Sean T. Malone, Ph.D.

**Professional Experience and Academic Qualifications**

14. He received his Bachelor of Arts degree in Financial Economics from Capital University, his Master of Science degree in Finance from the University of Texas at San Antonio, and his doctorate in Finance from the University of Texas at San Antonio.

15. From July 2019 to the present, he has been a senior statistical research associate at Analytic Focus LLC, which provides consulting services for numerous public and private entities on a wide range of topics. His experience includes supporting expert testimony for litigation topics including: construction defects, discriminatory mortgage lending, housing violations, and securities. Prior to joining Analytic Focus, LLC, he taught

undergraduate courses in business finance; investments; money and banking; and financial case studies at the University of Texas at San Antonio.

16. His professional and academic experience and a list of his publications for the previous 10 years are included in his resume, a true and correct copy of which is attached as Exhibit 4.

**Previous Expert Testimony**

17. He has not given expert testimony during the previous four years.

**Compensation**

18. He is being compensated for his work on this engagement at the rate of $375 per hour for his time. The payment of his fees is not contingent on the opinions he expresses in connection with this engagement.

## IV. Modeling the Need for Abatement Resources

*This section addresses how one reasonably measures the needs of states in dealing with the opioid epidemic in terms of the economic harm suffered in the past and continuing into the foreseeable future. Investments are required to abate the epidemic, and greater investments are required in localities with greater intensity of harm.*

19. There are three vital statistics used to model the need for opioid abatement resources: drug related deaths, substance abuse disorders, and amounts of prescription opioid drugs. These measures are key in understanding intensity and severity of the opioid epidemic.

20. Considering each of these as an input, we believe that drug related deaths is a type measure of severity, particularly measured as a rate in the relevant population. The worse

the addiction problem, the more likely a person is to succumb to their addiction and die. For substance abuse disorders, we consider a measure like "opioid use disorder" (OUD) not treated, as representing a number of persons who are addicted to opioids but untreated. This presents an explicit measure of the number or percent of sufferers who will need treatment in the future – a bill that will hit hardest on states with the highest rates of OUD not treated.

21. Finally, the amounts of prescription drugs represent the flooding of a market, like a state, with the cause of the opioid crisis. Large volumes of prescription drugs, by count, are almost perfectly correlated with population count, so including population count as part of a metric simply double counts a measure of population. The rate of prescription drugs, computed as a number of prescriptions divided by the population size, is a measure of intensity, as the more drugs prescribed per person measures how many drugs were pushed onto a populace.

22. For each of these inputs (deaths, disorders, and scripts), we reiterate that there are three ways to present the underlying statistic. One can provide a count, percentage share, or a rate of incidence.

23. A count is simply the raw statistic and provides the information concerning how many deaths, drugs, or individuals with substance abuse disorders.

24. Percentage shares convey the same information as counts, except they are standardized so the total across all groups, in this context groups are states, is equal to

100%. A percentage share is a count (the numerator) divided by the total of all counts across groups (the denominator). For example, there were 1,000 drug overdose deaths in in a state and 60,000 across all states, that state's percentage share of drug overdose deaths was 1.67%. Percentage shares are helpful because the difference in scale between the underlying statistics is controlled for, making any two statistics comparable without further calculation.[3]

25. Rates of incidence convey a measure of risk or how likely these events are to occur to a member of a defined population. A rate of incidence is a count (the numerator) divided by the count of a relevant defined population (the denominator). For example, a mortality rate is a rate of incidence where the count of deaths divided by the general population count.

26. Plans based on counts or percentage shares of counts merely compare the scale of the opioid epidemic across states by counting within each state approximately how many opioids were shipped, how many people developed harmful addictions, and how many people died. The Denver Plan, one of the more significant inputs to the NOAT plan, is an example of a count-based plan.

[3] For example, when deciding how much advertising to spend across states, knowing that 2% of existing sales and 4% of the target market is in State A is instantly useful. In contrast, knowing that $7,800,522 existing sales and 400,000 of the target market are in State A is markedly less useful without more information.

27. If one assumes that the cost of abatement related to a single count of these statistics is the same for every state, using the count or percentage shares to allocate abatement resources would be appropriate. However, our analysis in this report rebuts this assumption.

28. Assuming equal risk, large groups will always have more incidents (deaths, individuals with substance abuse disorders, etc.). Rates relate the number incidents to the size of the comparison groups. The resulting differences are due to differences in risk. In this case, intensity captures the level of opioid epidemic risk to a typical individual. This level of risk is *not* captured in counts or percentage shares alone.

29. In later sections of this report, we provide arguments that "intensity," a category of rate of incidence measures, is positively related to the cost of abatement for each incident of any of these statistics. In other words, the abatement resources needed for a single individual with opioid use disorder (or a single drug poisoning death) will be greater in states with higher intensity metrics. Any allocation plan or formula that does not reasonably incorporate intensity measures for all states will not produce allocations aligned with their needs for abatement resources.

### A. Defining Intensity and Severity in the Opioid Crisis

30. In the following section, we discuss two terms: intensity and severity. Both are measured using rates of incidence.

31. When we refer to intensity, we are referring to rates of incidence we use to determine which states have been hardest hit by the opioid crisis. The denominators are general population counts. Intensity metrics convey how likely an opioid crisis related event is to happen to a typical individual in a state. We discuss two intensity measures: mortality intensity and disorder intensity.

$$\text{Mortality Intensity} = \frac{\text{Drug Poisoning Deaths}}{\text{Population}}$$

$$\text{Disorder Intensity} = \frac{\text{Opioid Use Disorder Not Treated}}{\text{Population}}$$

32. When we refer to severity, we are referring to rates of incidence use to determine which states have individuals with the highest average strength and deadliness of opioid dependency. The denominators are counts of opioid-affected populations. Severity metrics convey how likely an opioid crisis related event is to happen to an individual in a state who is already affected by opioids. We discuss two severity measures: mortality severity and disorder severity.

$$\text{Mortality Severity} = \frac{\text{Opioid Drug Poisoning Deaths}}{\text{Opioid Use Disorder}}$$

$$\text{Disorder Severity} = \frac{\text{Opioid Use Disorder}}{\text{Opioid Misuse}}$$

33. Mortality Severity is a proxy of how likely it is for an individual to die from an opioid-related drug poisoning given that they had Opioid Use Disorder. This measure indicates the severity of opioid addiction in individuals, as a more severe addiction would be more likely to result in death.

34. Disorder Severity is another indicator of the severity of opioid addiction in individuals based on two measures of opioid abuse from the National Survey on Drug Use and Health (NSDUH). The first is opioid misuse this is the number of individuals who have misused opioids in the past year. The second, Opioid Use Disorder, is defined as meeting the criteria for opioid dependence or abuse according to *Diagnostic and Statistical Manual of Mental Disorders*. Thus, individuals meeting the criteria for opioid use disorder have established a more serious pattern of opioid use than misuse alone. The ratio of opioid use disorder to opioid misuse proxies how likely opioid abuse in an individual will worsen into the more severe classification, opioid use disorder.

**B. The Intensity of the Opioid Crisis Varies Greatly across the States**

35. The opioid crisis is a deadly problem throughout the United States. But, the intensity each state experiences is not equal. To demonstrate this fact, we have chosen to present two metrics available from public sources.

36. First, we provide a summary of drug poisoning mortality rates. This data is available from the Centers for Disease Control via their WONDER tool. Second, we provide a summary of opioid use disorder (not treated). SAMHSA draws this data from the National Survey on Drug Use and Health.

37. Table 1 below presents mortality rates for drug poisoning. This rate is the number of drug poisoning deaths divided by the age-adjusted population and is available from

the CDC.[4] This is an average annual rate for the years 2007-2019. This table only presents the five most intense states, the five least intense states, and the national average. In other words, ranking states by intensity using drug poisoning mortality rates, this table shows both ends of the intensity spectrum.

**Table 1: Mortality Intensity**

| | | **Age-Adjusted Mortality Rate (per 100,000)** |
|---|---|---|
| **5 Most Intense States** | West Virginia | 36.65 |
| | Kentucky | 26.00 |
| | New Mexico | 25.33 |
| | Ohio | 25.14 |
| | Pennsylvania | 24.43 |
| **National Average** | | **15.70** |
| **5 Least Intense States** | Texas | 9.81 |
| | Iowa | 9.11 |
| | South Dakota | 7.27 |
| | Nebraska | 6.90 |
| | North Dakota | 6.59 |

38. West Virginia is the state that experienced the highest intensity during this time, according to this single metric. The mortality rate in West Virginia is 2.33 times the national average. When compared to a lower intensity state like Texas, a typical individual in Texas was about one-quarter as likely to die from drug poisoning as in West Virginia.

[4] The age-adjusted rates for drug poisoning deaths for each state and the national average from 2007 through 2019 is from the Multiple Cause of Death dataset provided by the CDC. The following UCD codes were included: X40-X44, X60-X64, X85, and Y10-Y14.

39. Table 2 below presents rates for opioid use disorder, not receiving treatment. This rate is the estimated count of individuals with opioid use disorder (OUD) who have not received specialty substance abuse treatment. This is an average annual rate for the years 2015-2018 and is calculated from National Survey on Drug Use and Health (NSDUH) data.[5]

**Table 2: Disorder Intensity**

| | | **OUD not Treated Rate (per 100,000)** |
|---|---|---|
| **5 Most Intense States** | Kentucky | 1,137.29 |
| | New Hampshire | 948.28 |
| | Idaho | 933.91 |
| | Vermont | 919.12 |
| | Washington | 912.20 |
| **National Average** | | 620.88 |
| **5 Least Intense States** | Hawaii | 431.78 |
| | Kansas | 421.23 |
| | Wyoming | 416.67 |
| | New York | 400.07 |
| | Minnesota | 388.60 |

40. Kentucky is the state that experienced the highest intensity during this time, according to this single metric. The OUD not treated rate in Kentucky is 1.83 times the national average. When compared to a lower intensity state, such as New York, an individual in New York was 35% as likely to have opioid use disorder (and not be treated) as an individual in Kentucky.

[5] The estimated counts of opioid use disorder not treated and the relevant population counts from 2015-2018 are from the National Survey on Drug Use and Health provided by SAMHSA Data Archive.

41. Table 3 below presents both measures of severity for the state of West Virginia compared to the national average.[6] West Virginia, which has the highest mortality intensity in the United States, has disorder severity 1.53 times the national average, and mortality severity 1.91 times the national average. This means that an individual abusing opioids in West Virginia is 53% more likely to have opioid use disorder than a typical individual in the United States. Further, individuals with opioid use disorder in West Virginia are 90% more likely to die from an opioid-related drug poisoning than a typical individual with opioid use disorder in the United States.

**Table 3: West Virginia Severity Measures**

| | **West Virginia** | **National Average** |
|---|---|---|
| **Disorder Severity[7]** | 26.02 | 16.97 |
| **Mortality Severity[8]** | 24.37 | 12.78 |

42. The relationship between severity and intensity is present in numerous states – this concern regarding severity impacts many states suffering from the opioid crisis. Of the

[6] For reference, a table of intensity and severity measures discussed in this section calculated for all states is provided in Appendix 2.

[7] Opioid Used Disorder per 100 Individuals who misused opioids. Both Opioid Use Disorder estimated counts and Opioid Misuse estimated counts for years 2003-2018 are from the National Survey on Drug Use and Health.

[8] Opioid Overdose Deaths are from CDC WONDER for years 2003-2018 using UCD codes X40-X44, X60-X64, X85, Y10-Y14 and MCD codes T40.0, T40.1, T40.2, T40.3, T40.4, T40.6. Estimates of Opioid Use Disorder counts for 2003-2018 are from the National Survey on Drug Use and Health.

25 states with the highest severity metrics, 19 also have intensity metrics ranking them in the top 25 states based on intensity.[9]

43. A simple theoretical construct predicts this association using a negative feedback loop between high intensity and high severity during the opioid crisis. High intensity means that a greater proportion of the general population is affected by opioid abuse and dependence. This has several logistical, health, and economic implications.

44. First, states with the highest proportions of affected general population will have overwhelmed substance abuse treatment and related social services infrastructure. Overwhelmed infrastructure means that people may not get the treatment or services they need. There may simply be a lack of availability or standards may decrease in order to meet the overwhelming demand.

45. Research on healthcare outcomes in medical settings and strained or overworked providers is clear; providers pushed past normal capacity produce worse outcomes. For example, more overwork is associated with higher mortality and earlier discharges (higher turnover of patients),[10] patients admitted to strained ICUs have a shorter length of stay

[9] To rank all states by intensity and severity, we calculated each state's average relative intensity and average relative severity. Relative intensity is the intensity metric divided by the national intensity metric. Similarly, relative severity is the severity metric divided by the national severity metric. The average relative intensity is the simple average of the two relative intensity measures. Similarly, average relative severity is the simple average of the two relative severity measures.

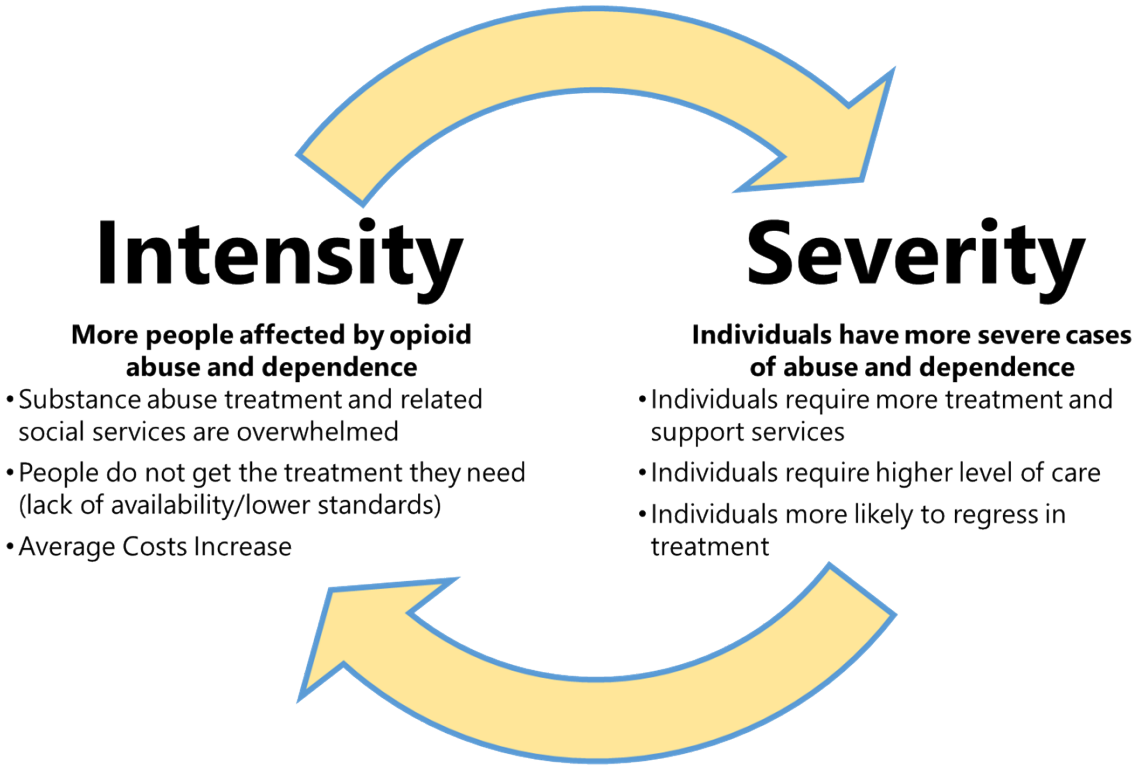
[10] KC, D. S., & Terwiesch, C. (2009). Impact of Workload on Service Time and Patient Safety: An Econometric Analysis of Hospital Operations. Management Science, 55 (9), 1486-1498.

and are more likely to be readmitted within 72 hours,[11] and patients admitted to emergency departments with strained capacity are more likely to be readmitted within a month.[12,13]

46. Overwhelmed infrastructure and the related worse outcomes, in turn, feed severity. If individuals are left unserved or underserved, the severity of their abuse and dependence is likely to increase. Individual with higher severity cases of abuse and dependence will require a higher level of care, more treatment, more support services, and are more likely to regress in their course of treatment and recovery.[14] These greater demands for treatment and related social services only increase the original intensity-related problems in the state's infrastructure. See Figure 1 below for an illustration of this relationship.

[11] Wagner, J., Gabler, N. B., Ratcliffe, S. J., Brown, S. E., Strom, B. L., & Halpern, S. D. (2013). Outcomes among patients discharged from busy intensive care units. *Annals of internal medicine*, *159*(7), 447–455.
[12] Marcin, James P. MD, MPH; Romano, Patrick S. MD, MPH Impact of between-hospital volume and within-hospital volume on mortality and readmission rates for trauma patients in California*, Critical Care Medicine: July 2004 - Volume 32 - Issue 7 - p 1477-1483.
[13] Stowell, A., Claret, PG., Sebbane, M. *et al.* Hospital out-lying through lack of beds and its impact on care and patient outcome. *Scand J Trauma Resusc Emerg Med* 21, 17 (2013).
[14] Shah, S., DeMatteo, D., Keesler, M., Davis, J., Heilbrun, K., & Festinger, D. S. (2015). Addiction Severity Index Scores and Urine Drug Screens at Baseline as Predictors of Graduation From Drug Court. Crime & Delinquency, 61(9), 1257–1277.

**Figure 1**




*Increased intensity and severity indicates greater need for abatement resources*

47. The relationship depicted above in Figure 1 provides two economic justifications for allocation models that reflect intensity. First, intensity reflects where existing state resources are most overwhelmed because the opioid crisis has affected a greater proportion of its population. Second, intensity is in part caused by individuals with more severe addictions.

48. Introductory microeconomic principles establish that overutilization of resources in the short-run causes higher average costs.[15] When any production center, whether a factory or a substance abuse treatment provider needs to increase its capacity beyond its current efficient levels, there are two potential actions.

49. The first possibility is to increase the capital resources. In the context of substance abuse treatment, these are fixed costs like more building space, equipment, or salaries for counselors or medical professionals. The second possible action is to use more variable resources, for example, pay for overtime at higher rates for current staff, hire additional hourly employees, or pay for patients to go to more expensive facilities which still have available capacity.

50. While the second option is a feasible solution in the short-term, it is not cost efficient. The additional variable resources have higher average costs less efficient at producing output. The first action, expanding the capital resources, allows to the production center to return to a long-run cost efficiency, but requires a larger upfront investment.

51. The infrastructure and other state resources related to substance abuse in high intensity states have been overwhelmed; and without massive capital investments, they

[15] See Pindyck, R. S., & Rubinfeld, D. L. (2009). *Microeconomics* (7th ed.) at page 243, "Why is the cost of production higher when capital is fixed? Because the firm is unable to substitute relatively inexpensive capital for more costly labor when it expands production."

have likely been operating inefficiently because they have not expanded capacity to appropriate levels.

52. Some examples of overwhelmed government resources caused by the opioid epidemic include: autopsy backlogs for drug overdose deaths, depleted funds to bury the indigent who have died from drug overdoses, and temporary cold storage mass casualty trailers to hold the deceased during peak periods of overdose deaths.[16]

53. As high intensity states tend to be high severity states, incorporating intensity into an abatement model intensity will better reflect needs for additional abatement funds than an abatement model based on counts or percentage shares alone. As described above, individuals with higher severity cases of abuse and dependence will require a higher level of care, more treatment, more support services, and are more likely to regress in their course of treatment and recovery. All of these increase the expected costs of abatement activities for these individuals over time.

## V. NOAT State Allocations

*This section describes a proposed allocation to states that cobbles together multiple other plans, simply compounding the confusion in the proposed allocation. NOAT is a political*

[16] See "Overdoses in W.Va. Drain Fund for Burials." The Intelligencer/Wheeling News-Register. March 5, 2017. Available at https://www.theintelligencer.net/news/top-headlines/2017/03/overdoses-in-w-va-drain-fund-for-burials/. Also, see "Too Many Bodies in Ohio Morgue, so Coroner Gets Death Trailer." NBC News. March 14, 2017. https://www.nbcnews.com/news/us-news/too-many-bodies-ohio-morgue-so-coroner-gets-death-trailer-n733446

*solution to a basic economic issue, which is allocating in such a way to effect the greatest good for the most people*.

54. The NOAT State Allocations[17] are derived from the Multi-State Group's effort to mash together various state-proposed allocation plans, resulting in an unwieldly, population-centric plan that fails to adequately address the intensity of the opioid epidemic. In this section, we describe the steps to arrive at the NOAT State allocation percentages and provide descriptions of the various incorporated allocation models.[18]

55. First, the NOAT state allocation percentages have two primary components. 85% of the state allocation percentages are calculated using the Multi-State group's formula. The remaining 15% are calculated using the Negotiation Class Metrics as described in Purdue's Disclosure Statement.[19]

*The Multi-State Group's Plan*

56. The Multi-State Group's Plan resembles a tree whose branches represent various allocation models proposed by different states. Some of these branches are intertwined and tangled amongst themselves – branches overlap, there is double counting, and each piece is simply a reaction to mollify one political issue rather than deal with the economics of the crisis.

[17] See Document 2867at p.143-144.
[18] We were provided a spreadsheet that of the top-level breakdown of the NOAT State allocation percentages, "CONFIDENTIAL-1.xlsx."
[19] See Document 2867 at pages 146-147.

57. To understand the Multi-State Group's Plan in full, one must first understand its evolution over time and become familiar with the names of its different component parts. The names of the various components derive either from the name of the state leading the proposal or the city where a meeting took place to discuss the plans.

*i. The Denver Plan*

58. At the heart of the Multi-State Group's formula is the Denver Plan.[20] The Denver Plan includes four count-based factors: the population size for each state, the number of opioid-related deaths, the number of people who used or abused pain relief drugs, and the number of morphine-milligram equivalent (MME) of prescription opioids.

59. Each of these factors is transformed into a state percentage share (the number for a state divided by the total number for all states and territories). These four factors were combined into a weighted-average using 31%, 22%, 22%, and 25%, respectively, to obtain an allocation share for each state. It is unclear why the Multi-State Group chose the weights that it did for the four factors. There was no explanation in the summary document that we reviewed as to why population had the highest weight in a model to measure need for abating the opioid epidemic.

60. The Denver Plan adopted an "intensity fund" to boost the allocations to 12 small states with a high intensity opioid problem. Under the Denver Plan, all states, except

[20] We were provided a summary of the Denver Plan, "CONFIDENTIAL-2.pdf."

California, would contribute 1% of their allocation funds to the intensity fund which would be redistributed to qualifying states. Qualifying states met two criteria: their baseline allocation (before contributing to the intensity fund) was less than 2% and the average of their rates used to assess intensity demonstrated that the state was more than 15% above the national average. The 12 small states with high intensity opioid problems were Connecticut, Delaware Kentucky, Maine, Nevada, New Hampshire, New Mexico, Oklahoma, Rhode Island, Utah, Vermont, and West Virginia.[21]

61. There were six states that had high intensity opioid problems, according to the second criteria, but were too large: Tennessee, Ohio, Pennsylvania, Maryland, Michigan, and Massachusetts. These states would contribute to the intensity fund but receive no benefit.

62. At the time it was created, the Denver Plan did not specify how the 1% intensity fund would be allocated to the 12 small intense states.

*ii. The Intensity Fund Plan*

63. Ultimately, a plan to allocate the 1% intensity fund among the 12 small, intense states was decided.[22] Under this Intensity Fund Plan, the 12 small and intense states would blend their allocations from three *other* allocation models proposed by specific states.

[21] The rates were equivalent to: state MMM per capita divided by national MME per capita, state PRUD per capita divided by national PRUD per capita, and state overdose deaths per capita divided by national overdose deaths per capita. An average rate greater than 1.15 demonstrates that state was more than 15% above the national average and thus had high intensity opioid problems. See "CONFIDENTIAL-2.pdf."
[22] See column E in "CONFIDENTIAL-3.xlsx."

These models include: the New Mexico Plan, the New Hampshire Plan, and the Vermont Proposal and are described below.

64. Note that the three sets of allocation shares (New Mexico severity metrics, New Hampshire, and Vermont) were adjusted from percentage shares relative to the United States to the percentage shares relative to the 12 small intense states. These adjusted percentages were blended with equal weights. The resulting percentage shares were used to distribute the 1% fund amongst the 12 small intense states. [23]

*a. The New Mexico Plan*

65. The New Mexico Plan three count-based factors: prescription opioid MME, Ruhm-adjusted[24] opioid death counts, and individuals who used or abused opioids. From these, three percentage share metrics were calculated.

66. The New Mexico Plan also proposed a "customized severity metric" calculated to represent the severity of the impact of opioids on states.

67. To calculate the severity metric, all of the three count-based factors are converted to incidence rates (per-capita rates). These incidence rates are transformed again to percentage shares for each state. The highest (worst) percentage share of the three factors

[23] See "CONFIDENTIAL-4.xlsx."

[24] "Ruhm-adjusted" refers to a method used to estimate opioid overdose deaths using information from drug poisoning deaths that may not report the types of drugs. See Ruhm, C. J. (2017). Geographic variation in opioid and heroin involved drug poisoning mortality rates. *American journal of preventive medicine*, *53*(6), 745-753.

is considered the customized severity metric for a state. The customized severity metric for each is then adjusted so it totals to 100% across all states.

68. The four metrics were combined with equal 25% weights to calculate the New Mexico Plan allocations. [25]

69. While the New Mexico Plan used a weighted-average of the four metrics, based on the final Intensity Fund Plan, it appears that rather than using the entirety of the New Mexico Plan, the element that appears to be included is the customized severity metric.

*b. The New Hampshire Plan*

70. The New Hampshire Plan uses three metrics, including each state's percentage share of Ruhm-adjusted opioid deaths, weighted at 70%, percentage share of MME incidence rate, weighted at 20%, and Ruhm-adjusted opioid death rate (a rate of incidence) as a percentage share, weighted at 10%.[26]

*c. The Vermont Proposal*

71. Under Vermont's proposal, the 1% intensity fund would be equally distributed among the 12 small, intense states. [27]

*iii. Small State Allocation Plan*

[25] See "CONFIDENTIAL-5.pdf" at p. 11.
[26] See "CONFIDENTIAL-6.pdf" at pages 3-4.
[27] While this is the element of Vermont's proposal that was used for the Denver Plan's 1% intensity fund, it is misrepresentative of Vermont's proposal. Vermont's proposal was to take either 5% or 10% as a set aside fund and distribute that equally among the states and territories. The remaining 95% or 90% was to be allocated using an earlier version of the Denver Plan. See "CONFIDENTIAL-7.pdf."

72. In addition to the Denver Plan and the Intensity Fund Plan, the Small State Allocation Plan was developed to re-allocate portions of the shares of Kentucky and Oklahoma, both of which had previously settled with Purdue. Excluding Kentucky and Oklahoma, only the 34 smallest states (those with populations less than the state of South Carolina) are eligible to receive any of the re-allocated shares. The Small State Allocation Plan has two metrics. The first metric is the difference between each state's Denver Plan allocation and its New Mexico Plan allocation. This metric is converted to a percentage share relative to the total across the 34 eligible states. The second metric each state's population as a percentage share relative to the total across the 34 eligible states (each state's population divided by the sum of the populations for the 34 eligible states). These two metrics are weighted at two-thirds and one-third, respectively.[28]

*Negotiating Class Metrics*

73. The remaining 15% of the NOAT state allocation percentages are calculated using the Negotiation Class Metrics applied at the state level.

74. There are three count-based factors in the Negotiating Class Metrics: opioid use disorder, overdose deaths, and opioid MME. The three factors are converted to percentage shares and equally weighted determine the Negotiating Class Metrics allocations.[29]

[28] The rules for the Small State Allocation Plan were not provided to us in any documents produced by the Multi-State Group but were communicated to us by the Office of the West Virginia Attorney General.
[29] See Document 2867

## VI. NOAT Allocations are not Equitable to Creditor States and Territories in Relation to their Needs for Abatement Resources

*This section considers how an equitable allocation would consider the needs of the populace to resolve the opioid crisis. By ignoring certain factors and puffing up other factors as a pseudo-weighting, the allocation winds up rewarding size of population, not needs within populations.*

### A. The NOAT allocations place an unwarranted importance on population as a metric to allocate funds to abate the opioid crisis.

75. As described earlier, the most important metric in the Denver Plan, with a 31% weight, is population. However, we are aware of a method used for funds distribution by the Federal government to states for opioid abatement which does not use population as a stand-alone metric. This method is used for the State Opioid Response Grant Program.

76. In 2018, Congress authorized the State Opioid Response Grants which would provide states access to nearly $2 billion over two years for the purpose of addressing the opioid crisis.[30] Another two years (2020-2021) of State Opioid Response grants provided access to another nearly $3 billion.[31] Each of these programs had the same general method for allocation. First, 15% of the funds were set aside for the highest intensity states, as measured by the mortality rate related to opioid use disorders. Second, the

[30] See U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. State Opioid Response Grants Funding Opportunity Announcement (FOA) No. TI-18-015. Accessed at https://www.samhsa.gov/sites/default/files/grants/pdf/sorfoafinal.6.14.18.pdf.

[31] See U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. State Opioid Response Grants Funding Opportunity Announcement (FOA) No. TI-20-012. Accessed at https://www.samhsa.gov/sites/default/files/grants/pdf/fy-2020-sor-foa.pdf.

Department of Health and Human Services Substance Abuse and Mental Health Services Administration (SAMHSA) was granted the authority to determine the most objective and reliable measures of drug use and drug-related deaths to determine the allocations for the remaining funds to the states, territories and the District of Columbia. [32]

77. The Denver Plan, at the core of the NOAT state allocations, has set aside less than 1% of funds for an intensity fund to go the top 12 small intense states. When compared to the SAMHSA State Opioid Response grants, the Denver Plan places less than one-fifteenth as much importance on intensity in its allocation methods.

78. The funding opportunity announcements for the State Opioid Response Grants provided formulas featuring the metrics that HHS and SAMHSA decided to use in fulfilling their responsibility to choose the most objective and reliable measures of drug use and drug-related deaths. These metrics were used to allocate the remaining 85% of available funds in both the 2018 and 2020 State Opioid Response Grants.

79. In both iterations, the allocation formula was based on two equally weighted elements: each state's percentage share of people who meet criteria for dependence or abuse of heroin or pain relievers who have not received any treatment and each state's percentage share of drug poisoning deaths. The SAMHSA State Opioid Response Grants grant allocations do not rely on population as a standalone metric.

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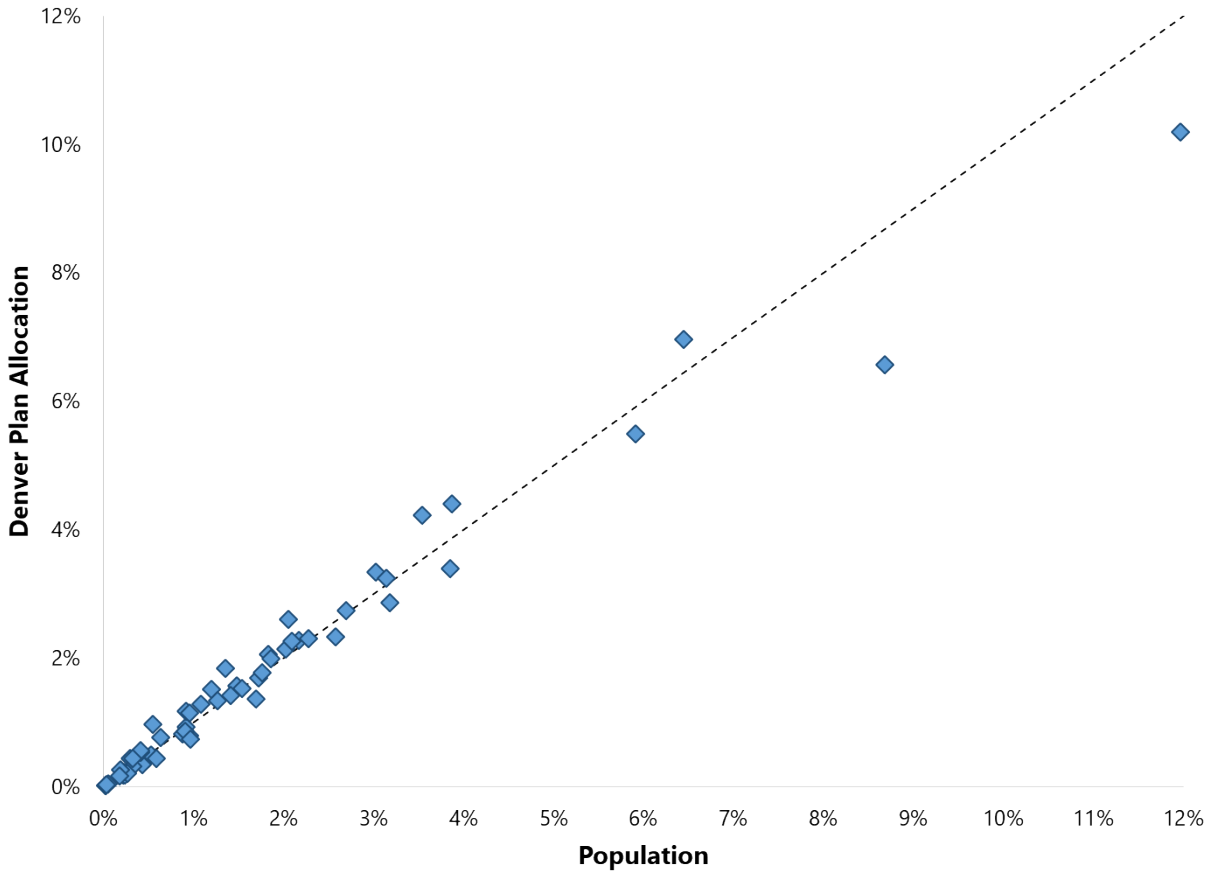
[32] See Consolidated Appropriations Act, 2018 at page 378-379. Accessed at https://www.congress.gov/115/plaws/publ141/PLAW-115publ141.pdf.

80. Congress, SAMHSA, and HHS did not use population as a standalone metric as the Multi-State Group did in the Denver Plan. In light of the SAMHSA State Opioid Response Grant formulas, the Multi-State Group's decision to make population the most important factor in an allocation model for opioid abatement resources appears especially inappropriate. Population is already embedded in counts and percentage shares of opioid MMEs, opioid-related drug poisoning deaths, and pain reliever use disorder. The Denver Plan is effectively quadruple counting population.

81. Consider a hypothetical allocation plan which only has a single metric: percentage share of population. Only 6.6% percent of funds would need to shift hands between amongst states to arrive at the same allocations produced by the Denver Plan even after the 1% intensity fund is considered. Figure 2 below plots the Denver Plan allocations against state populations as a percentage share. Each data represents the Denver Plan allocation along the vertical axis and the state's percentage share of population on the horizontal axis. The dashed line represents the (at 45 degrees) represents the hypothetical population-only allocation plan.

**Figure 2: Denver Plan Allocations and State Population**




82. The Denver Plan is extremely close to a plan based only on population. The impacts of the opioid epidemic cannot be represented by population alone. This is not a new or novel critique of the Denver Plan; this issue has been raised by other states when proposing alternatives.[33]

### B. The NOAT allocation does not appropriately address that the intensity of the opioid crisis varied across states

[33] See CONFIDENTIAL-5.pdf at p. 2, for example.

*(1) The allocation plan used by SAMHSA to distribute funds for abatement of the opioid crisis to states places a much higher importance on intensity than the Denver Plan.*

83. The SAMHSA SOR allocation method has been applied to $5 billion of available funds and twice approved by Congress. It is puzzling why the Denver Plan, and as a result, the NOAT state allocation percentages, glaringly fail to give proper weight to intensity.

84. The SAMHSA State Opioid Response allocation model is not a model put forth by self-interested states. The discussions between states to determine an allocation formula was from the start an attempt to reinvent the wheel as Congress, HHS, and SAMHSA had already created one by 2018.[34] The large number of alternative proposals indicate that not all states are satisfied with the resulting plan, which is largely a product of the original Multi-State proposal. A number of alternative proposals have highlighted increasing the importance of intensity in the allocation plan.[35] However, the states which have taken leadership in discussions concerning interstate allocation appear to have ultimately minimized the consideration of intensity. While some of the intensity-focused plans have been incorporated, they are only used to allocate a miniscule amount of the total funds.

85. For reference, Table 3 below lists the difference the 2020 SAMHSA State Opioid Response Grants and the Denver Plan for the 10 states which have the largest absolute

[34] *Supra* note 30 at page 5.
[35] *Supra* note 33. Also, see "CONFIDENTIAL-6.pdf" at p. 5.

differences. The state allocation percentages from the 2020 SAMHSA State Opioid Response grants are provided in Appendix 2.

**Table 3**

| State | Denver Plan Allocation | SAMHSA SOR Allocation (2020) | Difference |
|---|---|---|---|
| **States with largest differences where allocations from the Denver Plan are larger:** | | | |
| Texas | 6.57% | 3.68% | 2.90% |
| California | 10.19% | 7.46% | 2.73% |
| New York | 5.50% | 3.96% | 1.54% |
| Georgia | 2.87% | 2.06% | 0.81% |
| Illinois | 3.39% | 2.59% | 0.80% |
| **States with largest differences where allocations from SAMHSA SOR are larger:** | | | |
| Massachusetts | 2.26% | 4.01% | -1.75% |
| New Jersey | 2.74% | 4.65% | -1.91% |
| West Virginia | 0.97% | 3.08% | -2.11% |
| Delaware | 0.44% | 2.59% | -2.15% |
| Ohio | 4.23% | 6.78% | -2.55% |

**C. The methods used to determine the NOAT allocations have special rules for small subsets of states rather than determining the allocations under the same set of rules for all states.**

86. The state and territory creditors should be treated equitably under an accepted allocation plan. The Multi-State Group's Plan that is used to calculate the allocations for 85% of the NOAT funds has several embedded complexities that single out individual states or small subsets of states.

87. There are subsets of states that receive different treatment than the other states in the Multistate Group's Plan. There are several sets of rules that determine the final allocation based on state characteristics. These state groups often are differentiated by

arbitrary cutoffs that make them inequitable to those in close proximity to the cutoff point. For example, if 12 small and high intensity states receive funds from the abatement fund, there is a thirteenth state which is small and also has above average intensity, but receives nothing from the intensity fund. This section describes three subsets of states that receive allocations based on rules that are different from the rules applied to all other states and territories.

*(1) Small and Intense States*

88. Only 12 small intense states are eligible for a share of the Denver Plan's intensity fund. This means that all the other above average intensity states do not receive any additional allocations accounting for intensity.[36] Further, larger states are completely excluded from the intensity set aside fund. The highest intensity states are not exclusively small in population. For example, Table 1 shows Ohio and Pennsylvania as the fourth and fifth most intense states by age-adjusted drug poisoning mortality rates.[37]

[36] It should also be noted that a similar critique applies to the SAMHSA State Opioid Response Grants. While the State Opioid Response Grants have a 15% intensity set aside fund, only the 10 highest intensity states are eligible to receive any of it. More than 10 states had above average intensities and intensity should be a consideration for allocation to all states and territories. While SAMHSA gave a more appropriate weight to intensity, some amount of the additional allocation could have gone to bolstering other above average states.

[37] Both Ohio and Pennsylvania were eligible to receive additional funds from the 15% intensity set aside in the 2020-2021 SAMHSA SOR grant.

*(2) Small States*

89. The Multi-State Group's Plan adjusts the Denver Plan to account for previous settlements states have made with Purdue.[38] These settlement adjustments were re-allocated to other states. Only states with a population smaller than South Carolina were eligible to receive any of the funds created by the previous settlement adjustment.

*(3) California*

90. California is the only state, district, or territory that does **not** contribute to the intensity set aside fund in the Denver Plan. We are unaware of any economic rationale for this exception. California's intensity rank according to the age-adjusted drug poisoning mortality rate was 44 out of 51 states.[39] California's base allocation from the Denver Plan is 10.19%. The result of this outré exclusion is that California saves itself from contributing to the "1% intensity fund", which in turn decreases the size of the intensity fund to 0.9%, a 10% decrease in the funds.

[38] Oklahoma's Allocation before any intensity funds is adjusted by $41,617,880.10 to account for its settlement with Purdue in 2019. Kentucky's Allocation before any intensity funds is adjusted by $18,000,000 to account for its settlement with Purdue in 2015.

[39] Note the data source for age-adjusted mortality rates does not report data for the territories.

## VII. An Alternative Model to Allocate NOAT Funds to States

*This section presents an alternative model for allocation, based on intensity and severity measures published by the Federal government. This model, based on the economic arguments raised earlier, provides a better plan for states to encourage an allocation that addresses continuing issues in states and territories that have suffered the most in this crisis.*

91. The previous sections laid out the complexities of the Multi-State Group's plan and its two key flaws. These flaws make the plan inequitable to the creditor states and territories by not adequately reflecting state and territory needs for opioid abatement resources. First, the Multi-State Group's Plan does not place enough weight on intensity as measured by rates of opioid related deaths or opioid use disorder. Intensity indicates where more resources per opioid metric (e.g., individual with harmful addictions, overdose deaths) are needed. Second, several steps in the allocation algorithm do not apply evenly to all creditor states and territories. Some states are treated differently from the others if the states are small states, or if the states are small and intense states, or if the state is California.

92. In this section we describe an alternative model designed to reflect the need for opioid abatement resources by incorporating the relative level of intensity in every state, not just the top 10 or 12 intensity states. The resulting model does not arbitrarily choose subsets of states to treat differently, but applies the same rules to all states and territories. Most importantly, it provides a compromise between the Denver Plan and the SAMHSA

State Response Grants allocation formula in terms of how much total allocation should go to the most intense states. The proposed model requires six steps.

93. The first step is to calculate each state's percentage share of drug poisoning deaths and opioid use disorder not treated. [40, 41]

94. The second step is to compute a simple (equal-weighted) average of the two metrics computed in the previous step.[42] The result is the state's equal-weighted metric. The definition of this equal-weighted metric is very similar to the SAMHSA State Opioid Response Grants as both use the percentage share of drug poisoning deaths and the percentage share of opioid use disorder not treated from the same reliable sources.

95. The third step is to compute the two relative intensity metrics for each state. The first relative intensity metric is the relative mortality intensity which is equal to the state drug poisoning age-adjusted mortality rate divided by the national drug poisoning age-adjusted mortality rate.[43] The second relative intensity metric is the relative OUD not

[40] The count of drug poisoning deaths for each state from 2007 through 2019 is from the Multiple Cause of Death dataset provided by the CDC. The following UCD codes were considered: X40-X44, X60-X64, X85, and Y10-Y14. This data is available for the states and the District of Columbia only. The age-adjusted mortality rate is provided by the same source for each state and the national average.

[41] The estimated count of opioid use disorder (OUD) not treated from 2015-2018 is from the National Survey on Drug Use and Health and provided by SAMHSA Data Archive. This data is available for the states and the District of Columbia only. The OUD not treated intensity rate is calculated from the same source for each state and the national average.

[42] Since these two metrics are not published for territories, each proportion metric is assumed to be equal to the territory's proportion of population.

[43] *Supra* note 4.

treated intensity which is equal to the state OUD not treated rate divided by the national OUD not treated rate.[44]

96. The fourth step is to determine the state's intensity adjustment ratio which is equal to the greatest value of the two relative intensity metrics. This is similar in spirit to the New Mexico Plan, which chose a customized severity metric for each state. Allowing each state's intensity to represent its worst metric combats the possibility that some states will receive lower allocations simply because the opioid epidemic did not manifest itself in the same statistics as the one arbitrarily chosen in the allocation model.

97. The fifth step is to multiply the equal-weighted metric by the intensity adjustment ratio. The product is the intensity adjusted metric.

98. The sum of all the states' intensity adjusted metrics will not total to 100%. The sixth step is to calculate each state's percentage share of the total intensity adjusted metrics in the United States.

99. The sixth step determines each state and territory's allocation unless any state or territory's allocation is below the minimum amount required. A minimum allocation serves to cover base costs associated with the opioid epidemic. Every state and territory has at least some fixed costs (costs that don't vary with other opioid metrics) associated with the opioid epidemic that requires funding. The minimum amount required for states is 0.45%

[44] *Supra* note 5.

and 0.05% for territories.[45] If any states or territories are below the minimum amount, iterate through the process, removing the additional amount required from the funds being allocated by the intensity adjusted metric until all states and territories have the minimum amount.

100. Appendix 3 provides a table that details the allocations calculated using the method described above.

101. Table 4 below summarizes the total amounts allocated to groups of states based on mortality intensity under the Denver Plan, the 2020-2021 SAMHSA SOR formula allocations, and the Greater Intensity Adjusted Allocation Plan.

**Table 4**

| | **Total Allocation to States with Top 10 Mortality Intensity** | **Total Allocation to States with above Average Mortality Intensity** |
|---|---|---|
| **Denver Plan** | 15.93% | 54.08% |
| **SAMHSA SOR** | 28.65% | 66.26% |
| **Greater Intensity Adjusted Plan** | 23.93% | 64.73% |

102. The SAMHSA State Opioid Response formula made 28.65% of the funds available to the ten states with the highest mortality severity.[46] This was 80% more than the Denver Plan allocated to the same states. Relative to the SAMHSA SOR, the Greater

[45] SAMHSA State Opioid Response Grants have a similar minimum amount, for example, in 2018, the minimum allocation amounts were 0.43% and 0.027% of the total available awards for states and territories, respectively.

[46] West Virginia, Kentucky, New Mexico, Ohio, Pennsylvania, Delaware, New Hampshire, Rhode Island, District of Columbia, and Maryland.

Intensity Adjusted Plan provides a compromise on funds allocated to the ten highest mortality severity states, as our plan allocates only 50% more than the Denver Plan.

103. The Greater Intensity Adjusted Plan nearly matches the amount allocated to states with above average mortality intensity. This table highlights an advantage of the Greater Intensity Adjusted Plan relative to the Denver Plan and the SAMHSA Plan; funds allocated based on intensity are not only given to the highest severity states based on an arbitrary rank or size cutoff, but benefit all states with above average intensity.

104. The resulting model can integrate equitable adjustments for previous state settlements. We could quickly and efficiently produce to the Court such an allocation model using equitable re-allocation methods if asked to do so.

## VIII. Conclusions

105. This report first describes the essential statistics necessary to model the impact of the opioid epidemic and the resulting needs for abatement resources. It then paints a picture of the process that the states, district, and territories have gone through to negotiate an interstate allocation plan by explaining how to arrive at the Multi-State's final proposal for the National Opioid Abatement Trust state allocations.

106. This navigation requires an understanding of many alternative plans put forth by states not in agreement with the initial Denver Plan, and alternative sets of rules that apply only to certain groups of states. This unnecessary complexity indicates that states and territories are far from unanimous on their choice of plan. These complexities

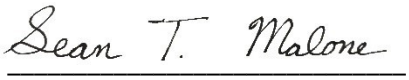
appear to give a minimum amount of influence to plans that incorporate measures of intensity. This miniscule weight on intensity and the complexity used to incorporate it is unreasonable. There is a simple method to incorporate intensity and is described in the proposed allocation model in this report.

107. In the final section, we propose an allocation model that accomplishes two things. It provides less complex set of rules built on reliable public data, related to opioids, not just population. But, most importantly, it is more closely aligned with the states' needs for abatement resources because it places more weight on intensity, which is likely to indicate a state will require more abatement resources to treat a single incident of an opioid-related problem (e.g., Opioid use disorder, overdose, etc.).

108. We hereby certify that this report is a complete and accurate statement of all of our opinions, and the basis and reasons for them, to which we will testify under oath.

Date: July 5, 2021

Charles D. Cowan, Ph.D.



Sean T. Malone, Ph.D.

# APPENDIX 1

**Appendix 1: 2020 SAMHSA State Opioid Response Grant Formula**

| State | 2020 Available Funds | Allocation Percentage |
|---|---|---|
| Alabama | $16,079,227 | 1.13% |
| Alaska | $4,000,000 | 0.28% |
| American Samoa | $250,000 | 0.02% |
| Arizona | $31,593,073 | 2.22% |
| Arkansas | $10,756,580 | 0.76% |
| California | $105,819,731 | 7.45% |
| Colorado | $20,833,943 | 1.47% |
| Connecticut | $14,209,192 | 1.00% |
| Delaware | $36,789,643 | 2.59% |
| District of Columbia | $23,819,356 | 1.68% |
| Florida | $100,128,003 | 7.05% |
| Georgia | $29,263,842 | 2.06% |
| Guam | $250,000 | 0.02% |
| Hawaii | $4,000,000 | 0.28% |
| Idaho | $7,845,696 | 0.55% |
| Illinois | $36,764,508 | 2.59% |
| Indiana | $28,809,812 | 2.03% |
| Iowa | $8,977,768 | 0.63% |
| Kansas | $8,273,523 | 0.58% |
| Kentucky | $35,473,903 | 2.50% |
| Louisiana | $17,255,148 | 1.22% |
| Maine | $6,253,320 | 0.44% |
| Marshall Islands | $250,000 | 0.02% |
| Maryland | $50,739,768 | 3.57% |
| Massachusetts | $56,945,944 | 4.01% |
| Michigan | $36,425,488 | 2.57% |
| Micronesia | $250,000 | 0.02% |
| Minnesota | $11,225,707 | 0.79% |
| Mississippi | $7,158,964 | 0.50% |
| Missouri | $25,007,072 | 1.76% |
| Montana | $4,000,000 | 0.28% |
| Nebraska | $4,440,723 | 0.31% |
| Nevada | $16,529,534 | 1.16% |
| New Hampshire | $28,132,184 | 1.98% |
| New Jersey | $65,948,806 | 4.64% |

**Appendix 1 (continued): SAMHSA State Opioid Response Grant Formula**

| State | 2020 Available Funds | Allocation Percentage |
|---|---|---|
| New Mexico | $7,530,528 | 0.53% |
| New York | $56,211,200 | 3.96% |
| North Carolina | $35,134,491 | 2.47% |
| North Dakota | $4,000,000 | 0.28% |
| Northern Marianas | $250,000 | 0.02% |
| Ohio | $96,196,878 | 6.77% |
| Oklahoma | $15,966,634 | 1.12% |
| Oregon | $15,294,867 | 1.08% |
| Palau | $250,000 | 0.02% |
| Pennsylvania | $79,803,922 | 5.62% |
| Puerto Rico | $12,025,000 | 0.85% |
| Rhode Island | $4,391,975 | 0.31% |
| South Carolina | $17,931,882 | 1.26% |
| South Dakota | $4,000,000 | 0.28% |
| Tennessee | $30,104,533 | 2.12% |
| Texas | $52,171,902 | 3.67% |
| Utah | $10,716,588 | 0.75% |
| Vermont | $4,000,000 | 0.28% |
| Virgin Islands | $250,000 | 0.02% |
| Virginia | $27,628,925 | 1.95% |
| Washington | $27,162,281 | 1.91% |
| West Virginia | $43,756,934 | 3.08% |
| Wisconsin | $16,721,001 | 1.18% |
| Wyoming | $4,000,000 | 0.28% |

Notes: The 2020 Available Funds amounts were extracted from Appendix K of the SAMHSA State Opioid Response Funding Opportunity Announcement.

# AMENDED APPENDIX 2

**Appendix 2: State Intensity and Severity Measures**

| State | Drug Poisoning Age Adjusted Mortality Rate (per 100,000 population) | OUD not Treated (per 100,000 population) | Disorder Severity (per 100 Opioid Misuse) | Mortality Severity (per 1,000 OUD) |
|---|---|---|---|---|
| **Alabama** | 14.1 | 785.7 | 19.9 | 5.1 |
| **Alaska** | 15.9 | 683.8 | 13.9 | 14.2 |
| **Arizona** | 19.1 | 861.8 | 18.5 | 10.3 |
| **Arkansas** | 13.2 | 646.2 | 15.6 | 7.9 |
| **California** | 11.4 | 526.9 | 13.0 | 9.4 |
| **Colorado** | 15.8 | 817.6 | 11.9 | 13.9 |
| **Connecticut** | 18.8 | 653.6 | 21.0 | 14.7 |
| **Delaware** | 24.1 | 867.4 | 21.9 | 12.9 |
| **District of Columbia** | 21.6 | 511.9 | 18.8 | 20.6 |
| **Florida** | 18.0 | 727.7 | 18.0 | 13.6 |
| **Georgia** | 11.7 | 598.5 | 15.1 | 10.5 |
| **Hawaii** | 11.8 | 431.8 | 10.4 | 12.8 |
| **Idaho** | 13.0 | 933.9 | 17.7 | 6.4 |
| **Illinois** | 14.4 | 448.1 | 15.7 | 17.1 |
| **Indiana** | 18.9 | 778.6 | 16.5 | 8.8 |
| **Iowa** | 9.1 | 612.3 | 12.0 | 13.4 |
| **Kansas** | 11.2 | 421.2 | 11.5 | 11.3 |
| **Kentucky** | 26.0 | 1137.3 | 26.9 | 11.3 |
| **Louisiana** | 18.5 | 574.9 | 20.1 | 5.6 |
| **Maine** | 18.6 | 864.3 | 23.1 | 15.0 |
| **Maryland** | 21.0 | 595.1 | 21.3 | 21.8 |
| **Massachusetts** | 20.5 | 799.3 | 23.5 | 16.7 |
| **Michigan** | 18.3 | 604.8 | 16.1 | 13.4 |
| **Minnesota** | 9.9 | 388.6 | 11.6 | 13.4 |
| **Mississippi** | 11.5 | 775.8 | 17.9 | 5.7 |
| **Missouri** | 18.8 | 787.2 | 27.5 | 16.8 |
| **Montana** | 13.2 | 682.6 | 16.1 | 9.4 |
| **Nebraska** | 6.9 | 447.6 | 14.1 | 6.4 |
| **Nevada** | 20.6 | 848.5 | 13.6 | 21.3 |
| **National Average** | **15.7** | **620.9** | **17.0** | **12.8** |

**Appendix 2 (continued): State Intensity and Severity Measures**

| State | Drug Poisoning Age Adjusted Mortality Rate (per 100,000 population) | OUD not Treated (per 100,000 population) | Disorder Severity (per 100 Opioid Misuse) | Mortality Severity (per 1,000 OUD) |
|---|---|---|---|---|
| **New Hampshire** | 22.6 | 948.3 | 22.7 | 17.2 |
| **New Jersey** | 16.7 | 700.8 | 22.6 | 12.3 |
| **New Mexico** | 25.3 | 520.8 | 18.1 | 18.3 |
| **New York** | 12.6 | 400.1 | 16.8 | 14.1 |
| **North Carolina** | 16.0 | 518.1 | 17.1 | 16.7 |
| **North Dakota** | 6.6 | 648.3 | 13.5 | 8.0 |
| **Ohio** | 25.1 | 839.4 | 19.0 | 17.2 |
| **Oklahoma** | 19.3 | 530.6 | 15.4 | 15.4 |
| **Oregon** | 12.6 | 800.2 | 18.1 | 9.2 |
| **Pennsylvania** | 24.4 | 488.1 | 21.0 | 11.1 |
| **Rhode Island** | 22.4 | 661.5 | 19.0 | 17.2 |
| **South Carolina** | 15.9 | 768.3 | 19.2 | 10.8 |
| **South Dakota** | 7.3 | 567.4 | 13.5 | 9.8 |
| **Tennessee** | 20.7 | 751.5 | 19.8 | 14.1 |
| **Texas** | 9.8 | 440.2 | 14.0 | 9.0 |
| **Utah** | 21.0 | 658.2 | 19.1 | 18.7 |
| **Vermont** | 15.6 | 919.1 | 22.7 | 12.3 |
| **Virginia** | 12.1 | 557.5 | 15.8 | 14.0 |
| **Washington** | 14.4 | 912.2 | 15.9 | 12.2 |
| **West Virginia** | 36.7 | 708.8 | 26.0 | 24.4 |
| **Wisconsin** | 15.0 | 594.4 | 14.1 | 16.4 |
| **Wyoming** | 14.8 | 416.7 | 13.1 | 14.7 |
| **National Average** | **15.7** | **620.9** | **17.0** | **12.8** |

# APPENDIX 3

## Appendix 3: Greater Intensity Adjusted Plan

| State | Drug Overdose Deaths (CDC 2007-19) | OUD Not Treated (NSDUH 2015-18) | Proportion of Overdose Deaths | Proportion of OUD Not Treated | Equal-Weighted Metric | Drug Overdose Age Adjusted Mortality Rate (CDC 2007-19) | OUD Not Treated Rate (per 100,000) | Relative Mortality Rate | Relative OUD Not Treated Rate | Intensity Adjustment Ratio | Intensity Adjusted Metric | Intensity Adjusted Proportion | Allocation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 8,600 | 32,000 | 1.31% | 1.88% | 1.60% | 14.13 | 785.66 | 0.90 | 1.27 | 1.27 | 2.02% | 1.72% | 1.68% |
| Alaska | 1,517 | 4,000 | 0.23% | 0.23% | 0.23% | 15.92 | 683.76 | 1.01 | 1.10 | 1.10 | 0.26% | 0.22% | 0.45% |
| Arizona | 16,274 | 50,000 | 2.49% | 2.94% | 2.71% | 19.13 | 861.77 | 1.22 | 1.39 | 1.39 | 3.76% | 3.21% | 3.13% |
| Arkansas | 4,836 | 16,000 | 0.74% | 0.94% | 0.84% | 13.17 | 646.20 | 0.84 | 1.04 | 1.04 | 0.87% | 0.74% | 0.73% |
| California | 58,750 | 173,000 | 8.98% | 10.16% | 9.57% | 11.41 | 526.88 | 0.73 | 0.85 | 0.85 | 8.12% | 6.92% | 6.75% |
| Colorado | 11,201 | 38,000 | 1.71% | 2.23% | 1.97% | 15.82 | 817.56 | 1.01 | 1.32 | 1.32 | 2.60% | 2.21% | 2.16% |
| Connecticut | 8,747 | 20,000 | 1.34% | 1.17% | 1.26% | 18.85 | 653.59 | 1.20 | 1.05 | 1.20 | 1.51% | 1.28% | 1.25% |
| Delaware | 2,812 | 7,000 | 0.43% | 0.41% | 0.42% | 24.14 | 867.41 | 1.54 | 1.40 | 1.54 | 0.65% | 0.55% | 0.54% |
| District of Columbia | 1,851 | 3,000 | 0.28% | 0.18% | 0.23% | 21.63 | 511.95 | 1.38 | 0.82 | 1.38 | 0.32% | 0.27% | 0.45% |
| Florida | 45,543 | 129,000 | 6.96% | 7.57% | 7.27% | 18.05 | 727.66 | 1.15 | 1.17 | 1.17 | 8.52% | 7.26% | 7.08% |
| Georgia | 15,382 | 51,000 | 2.35% | 2.99% | 2.67% | 11.69 | 598.45 | 0.74 | 0.96 | 0.96 | 2.58% | 2.20% | 2.14% |
| Hawaii | 2,214 | 5,000 | 0.34% | 0.29% | 0.32% | 11.78 | 431.78 | 0.75 | 0.70 | 0.75 | 0.24% | 0.20% | 0.45% |
| Idaho | 2,626 | 13,000 | 0.40% | 0.76% | 0.58% | 13.00 | 933.91 | 0.83 | 1.50 | 1.50 | 0.88% | 0.75% | 0.73% |
| Illinois | 24,070 | 48,000 | 3.68% | 2.82% | 3.25% | 14.37 | 448.05 | 0.92 | 0.72 | 0.92 | 2.97% | 2.53% | 2.47% |
| Indiana | 15,607 | 43,000 | 2.38% | 2.52% | 2.45% | 18.89 | 778.56 | 1.20 | 1.25 | 1.25 | 3.08% | 2.62% | 2.56% |
| Iowa | 3,523 | 16,000 | 0.54% | 0.94% | 0.74% | 9.11 | 612.32 | 0.58 | 0.99 | 0.99 | 0.73% | 0.62% | 0.61% |
| Kansas | 4,046 | 10,000 | 0.62% | 0.59% | 0.60% | 11.21 | 421.23 | 0.71 | 0.68 | 0.71 | 0.43% | 0.37% | 0.45% |
| Kentucky | 14,433 | 42,000 | 2.21% | 2.47% | 2.34% | 26.00 | 1,137.29 | 1.66 | 1.83 | 1.83 | 4.28% | 3.65% | 3.56% |
| Louisiana | 10,755 | 22,000 | 1.64% | 1.29% | 1.47% | 18.47 | 574.86 | 1.18 | 0.93 | 1.18 | 1.73% | 1.47% | 1.44% |

## Appendix 3 (continued): Greater Intensity Adjusted Plan

| State | Drug Overdose Deaths (CDC 2007-19) | OUD Not Treated (NSDUH 2015-18) | Proportion of Overdose Deaths | Proportion of OUD Not Treated | Equal-Weighted Metric | Drug Overdose Age Adjusted Mortality Rate (CDC 2007-19) | OUD Not Treated Rate (per 100,000) | Relative Mortality Rate | Relative OUD Not Treated Rate | Intensity Adjustment Ratio | Intensity Adjusted Metric | Intensity Adjusted Proportion | Allocation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Maine | 3,087 | 10,000 | 0.47% | 0.59% | 0.53% | 18.56 | 864.30 | 1.18 | 1.39 | 1.39 | 0.74% | 0.63% | 0.61% |
| Maryland | 16,624 | 30,000 | 2.54% | 1.76% | 2.15% | 21.04 | 595.12 | 1.34 | 0.96 | 1.34 | 2.88% | 2.46% | 2.40% |
| Massachusetts | 17,918 | 47,000 | 2.74% | 2.76% | 2.75% | 20.51 | 799.32 | 1.31 | 1.29 | 1.31 | 3.59% | 3.06% | 2.99% |
| Michigan | 23,304 | 51,000 | 3.56% | 2.99% | 3.28% | 18.29 | 604.77 | 1.17 | 0.97 | 1.17 | 3.82% | 3.26% | 3.18% |
| Minnesota | 6,988 | 18,000 | 1.07% | 1.06% | 1.06% | 9.93 | 388.60 | 0.63 | 0.63 | 0.63 | 0.67% | 0.57% | 0.56% |
| Mississippi | 4,299 | 19,000 | 0.66% | 1.12% | 0.89% | 11.48 | 775.83 | 0.73 | 1.25 | 1.25 | 1.11% | 0.94% | 0.92% |
| Missouri | 14,334 | 40,000 | 2.19% | 2.35% | 2.27% | 18.84 | 787.25 | 1.20 | 1.27 | 1.27 | 2.88% | 2.45% | 2.39% |
| Montana | 1,684 | 6,000 | 0.26% | 0.35% | 0.30% | 13.17 | 682.59 | 0.84 | 1.10 | 1.10 | 0.34% | 0.29% | 0.45% |
| Nebraska | 1,611 | 7,000 | 0.25% | 0.41% | 0.33% | 6.90 | 447.57 | 0.44 | 0.72 | 0.72 | 0.24% | 0.20% | 0.45% |
| Nevada | 7,841 | 21,000 | 1.20% | 1.23% | 1.22% | 20.62 | 848.48 | 1.31 | 1.37 | 1.37 | 1.66% | 1.42% | 1.38% |
| New Hampshire | 3,789 | 11,000 | 0.58% | 0.65% | 0.61% | 22.62 | 948.28 | 1.44 | 1.53 | 1.53 | 0.94% | 0.80% | 0.78% |
| New Jersey | 19,241 | 53,000 | 2.94% | 3.11% | 3.03% | 16.65 | 700.78 | 1.06 | 1.13 | 1.13 | 3.41% | 2.91% | 2.84% |
| New Mexico | 6,552 | 9,000 | 1.00% | 0.53% | 0.76% | 25.33 | 520.83 | 1.61 | 0.84 | 1.61 | 1.23% | 1.05% | 1.03% |
| New York | 32,838 | 67,000 | 5.02% | 3.93% | 4.48% | 12.59 | 400.07 | 0.80 | 0.64 | 0.80 | 3.59% | 3.06% | 2.98% |
| North Carolina | 20,205 | 44,000 | 3.09% | 2.58% | 2.84% | 15.97 | 518.07 | 1.02 | 0.83 | 1.02 | 2.88% | 2.46% | 2.40% |
| North Dakota | 586 | 4,000 | 0.09% | 0.23% | 0.16% | 6.59 | 648.30 | 0.42 | 1.04 | 1.04 | 0.17% | 0.14% | 0.45% |
| Ohio | 36,618 | 82,000 | 5.59% | 4.81% | 5.20% | 25.14 | 839.39 | 1.60 | 1.35 | 1.60 | 8.33% | 7.10% | 6.93% |
| Oklahoma | 9,418 | 17,000 | 1.44% | 1.00% | 1.22% | 19.32 | 530.59 | 1.23 | 0.85 | 1.23 | 1.50% | 1.28% | 1.25% |
| Oregon | 6,660 | 28,000 | 1.02% | 1.64% | 1.33% | 12.64 | 800.23 | 0.81 | 1.29 | 1.29 | 1.72% | 1.46% | 1.43% |

## Appendix 3 (continued): Greater Intensity Adjusted Plan

| State | Drug Overdose Deaths (CDC 2007-19) | OUD Not Treated (NSDUH 2015-18) | Proportion of Overdose Deaths | Proportion of OUD Not Treated | Equal-Weighted Metric | Drug Overdose Age Adjusted Mortality Rate (CDC 2007-19) | OUD Not Treated Rate (per 100,000) | Relative Mortality Rate | Relative OUD Not Treated Rate | Intensity Adjustment Ratio | Intensity Adjusted Metric | Intensity Adjusted Proportion | Allocation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pennsylvania | 39,291 | 53,000 | 6.00% | 3.11% | 4.56% | 24.43 | 488.12 | 1.56 | 0.79 | 1.56 | 7.09% | 6.05% | 5.90% |
| Rhode Island | 3,102 | 6,000 | 0.47% | 0.35% | 0.41% | 22.43 | 661.52 | 1.43 | 1.07 | 1.43 | 0.59% | 0.50% | 0.49% |
| South Carolina | 9,829 | 32,000 | 1.50% | 1.88% | 1.69% | 15.91 | 768.31 | 1.01 | 1.24 | 1.24 | 2.09% | 1.78% | 1.74% |
| South Dakota | 747 | 4,000 | 0.11% | 0.23% | 0.17% | 7.27 | 567.38 | 0.46 | 0.91 | 0.91 | 0.16% | 0.14% | 0.45% |
| Tennessee | 17,417 | 42,000 | 2.66% | 2.47% | 2.56% | 20.65 | 751.48 | 1.32 | 1.21 | 1.32 | 3.37% | 2.87% | 2.81% |
| Texas | 33,687 | 100,000 | 5.15% | 5.87% | 5.51% | 9.81 | 440.24 | 0.62 | 0.71 | 0.71 | 3.91% | 3.33% | 3.25% |
| Utah | 7,318 | 16,000 | 1.12% | 0.94% | 1.03% | 21.00 | 658.17 | 1.34 | 1.06 | 1.34 | 1.38% | 1.17% | 1.14% |
| Vermont | 1,230 | 5,000 | 0.19% | 0.29% | 0.24% | 15.63 | 919.12 | 1.00 | 1.48 | 1.48 | 0.36% | 0.30% | 0.45% |
| Virginia | 12,972 | 39,000 | 1.98% | 2.29% | 2.14% | 12.08 | 557.54 | 0.77 | 0.90 | 0.90 | 1.92% | 1.64% | 1.60% |
| Washington | 13,594 | 56,000 | 2.08% | 3.29% | 2.68% | 14.36 | 912.20 | 0.91 | 1.47 | 1.47 | 3.94% | 3.36% | 3.28% |
| West Virginia | 8,293 | 11,000 | 1.27% | 0.65% | 0.96% | 36.65 | 708.76 | 2.33 | 1.14 | 2.33 | 2.23% | 1.90% | 1.86% |
| Wisconsin | 10,997 | 29,000 | 1.68% | 1.70% | 1.69% | 14.96 | 594.38 | 0.95 | 0.96 | 0.96 | 1.62% | 1.38% | 1.35% |
| Wyoming | 1,081 | 2,000 | 0.17% | 0.12% | 0.14% | 14.83 | 416.67 | 0.94 | 0.67 | 0.94 | 0.13% | 0.11% | 0.45% |
| American Samoa | 116 | 302 | 0.02% | 0.02% | 0.02% | | | | | 1.00 | 0.02% | 0.02% | 0.05% |
| Guam | 333 | 868 | 0.05% | 0.05% | 0.05% | | | | | 1.00 | 0.05% | 0.04% | 0.05% |
| Northern Marianas | 113 | 293 | 0.02% | 0.02% | 0.02% | | | | | 1.00 | 0.02% | 0.01% | 0.05% |
| Puerto Rico | 7,795 | 20,285 | 1.19% | 1.19% | 1.19% | | | | | 1.00 | 1.19% | 1.02% | 0.99% |
| Virgin Islands | 223 | 579 | 0.03% | 0.03% | 0.03% | | | | | 1.00 | 0.03% | 0.03% | 0.05% |

# EXHIBIT 1

**Exhibit 1: Materials on which we relied**

**Plan of Reorganization Documents**

1. Document 2867. Notice of Filing of Third Plan Supplement Pursuant to the Second Amended Joint Chapter 11 Plan of Reorganization of Purdue Pharma L.P. and its Affiliated Debtors.

**Confidential Documents Concerning Interstate Allocation Discussions**

1. CONFIDENTIAL-1.xlsx
2. CONFIDENTIAL-2.pdf
3. CONFIDENTIAL-3.xlsx
4. CONFIDENTIAL-4.xlsx
5. CONFIDENTIAL-5.pdf
6. CONFIDENTIAL-6.pdf
7. CONFIDENTIAL-7.pdf

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4. Stowell, A., Claret, PG., Sebbane, M. *et al*. Hospital out-lying through lack of beds and its impact on care and patient outcome. *Scand J Trauma Resusc Emerg Med* 21, 17 (2013).
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**Other Resources**

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3. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. State Opioid Response Grants Funding Opportunity Announcement (FOA) No. TI-18-015. Accessed at https://www.samhsa.gov/sites/default/files/grants/pdf/sorfoafinal.6.14.18.pdf.
4. U.S. Department of Health and Human Services, Substance Abuse and Mental Health Services Administration. State Opioid Response Grants Funding Opportunity Announcement (FOA) No. TI-20-012. Accessed at https://www.samhsa.gov/sites/default/files/grants/pdf/fy-2020-sor-foa.pdf.
5. Pindyck, R. S., & Rubinfeld, D. L. (2009). *Microeconomics* (7th ed.)
6. Consolidated Appropriations Act, 2018. Accessed at https://www.congress.gov/115/plaws/publ141/PLAW-115publ141.pdf.

# EXHIBIT 2

**CHARLES D. COWAN, Ph.D.**

ANALYTIC FOCUS LLC

## KEY QUALIFICATIONS

Charles D. Cowan is Managing Partner of ANALYTIC FOCUS LLC. Dr. Cowan has 40 years of experience in statistical research and design. He consults for numerous public and private sector entities on the design, implementation, and evaluation of research and the synthesis of statistical and sampling techniques for measurement.

Dr. Cowan has designed some of the largest and most complex research programs conducted by the Federal Government, including the Post Enumeration Program conducted by the Bureau of the Census to evaluate the 1980 Decennial Census, the Economic Cash Recovery valuations conducted by the Resolution Trust Corporation in 1990-95, and many evaluation studies conducted for the Justice Department, the Department of Defense, the Department of Housing and Urban Development, and the Treasury Department. He has provided expert advice to corporations and government agencies on the incorporation of complex research designs in demographic and economic measurement problems, including:

- Development of procedures used by the Resolution Trust Corporation and the FDIC for determination of the value of all assets held by the RTC\FDIC taken from failed banks and S&Ls. Results from this research were used in quarterly reports to Congress on the loss to the American taxpayer that resulted from these failures. These estimates of anticipated recoveries on assets were also used by the RTC and FDIC for financial reporting.

- Establishment of audit and sampling methods to determine the completeness and reliability of reporting and record systems. These procedures were used to both expand and streamline bank examinations for safety and soundness and also compliance measurement for the FDIC. These sampling techniques are applied in the audit of Federal agencies concerned with regulatory review of operations and systems, and related systems for banks, regulatory agencies, and law firms;

- Application of econometric and biometric procedures for measurement of credit risk in large portfolios of loans. These models are frequently used for a variety of purposes within financial institutions, such as the pricing of loans, the management of customers long term, decision making on workouts for delinquent loans, and for establishment of economic and regulatory reserves.

- Evaluation of research conducted for the Department of Defense, for the National Institutes of Health, and for the Department of Agriculture, each in response to Congressional inquiries on the validity of published results, and also for defendants in lawsuits involving evidence proffered by plaintiffs in furtherance of their suit.

- Model fitting and development of projection methods to measure the likelihood of loss or errors in recording in loans held by banks or put up for auction; measurement of the likelihood of fraud and/or noncompliance in systems, including bank holding companies, trading activities for brokers, and systems for compliance with health department and judicial requirements;

- Development of procedures used by the Bureau of the Census for apportionment of population for revenue sharing purposes and the estimation of the undercount in the Decennial Census of Population and Housing. These procedures include application of capture-recapture methods to measure the size of the undercount in the decennial census, use of network sampling as an alternative measure for population size, and measurement of the reliability of data collected in the Census.

- Development of statistical methods to quantify the size of populations, including nomadic populations for the Census of Somalia, the undercount and overcount in the Census of Egypt, the number of missing children in Chicago, IL, and the number of homeless persons and families needing services in several large cities with transient populations.

Dr. Cowan teaches graduate and undergraduate courses in survey methods, statistics, and computer methods for analysis. He is the co-author of two books, one on evaluation of survey and census methods and one on econometric measures related to the welfare of the U.S. economy. He has written numerous articles on statistical methods, sampling, rare and elusive population research, and optimization techniques.

Prior to cofounding ANALYTIC FOCUS LLC, Dr. Cowan was a Director with ARPC and with Price Waterhouse, where he specialized in financial research and audit sampling. From 1991 to 1996, Dr. Cowan was the Chief Statistician for the Resolution Trust Corporation and the Federal Deposit Insurance Corporation, where he designed research necessary to measure the loss from the Savings & Loan Crisis of the late 1980's. Dr. Cowan also served as the Chief Statistician for the U.S. Department of Education, where he designed large-scale surveys of educational institutions to measure resource needs and availability, and for Opinion Research Corporation, where he designed predictive models of demand for automobile manufacturers, banks, and large horizontally diverse firms like GE and AT&T. Dr. Cowan worked for the U.S. Bureau of the Census, where he was the Chief of the Survey Design Branch and developed many of the techniques in use today for the evaluation of coverage in surveys and censuses.

## EDUCATION

Ph.D., Mathematical Statistics, The George Washington University, 1984
M.A., Economics, The University of Michigan, 1973
B.A., English and B.A., Economics, The University of Michigan, 1972

## PROFESSIONAL EXPERIENCE

Co-Founder, ANALYTIC FOCUS LLC, January, 2002 to present.
Director, ARPC, November, 1999 to December, 2001.
Director, PricewaterhouseCoopers LLP, January 1997 to November, 1999.
Chief Statistician, Federal Deposit Insurance Corporation / RTC, 1991 to 1996.
Chief Statistician, Opinion Research Corporation, 1989 to 1991.
Chief Statistician, National Center for Education Statistics, US Dept. of Education, 1986 to 1989.
Bureau of the Census: Assistant Division Chief, International Statistical Programs Center, 1984 to 1986; Staff Liaison for Statistical Litigation Support, 1983 to 1984; Chief, Survey Design Branch, Statistical Methods Division, 1978 to 1983; Acting Chief, Survey Analysis and Evaluation Branch, Demographic Surveys Division, 1976 to 1978; Office of the Chief, Statistical Research Division, 1975 to 1976
Survey Research Center, Oregon State University: Manager, 1974 to 1975
Institute for Social Research, U. of Michigan: Assistant Study Director, 1972 to 1974.

## PROFESSIONAL ASSOCIATIONS

Professor, Statistics, University of Alabama – Birmingham
Associate Professor, Statistics, George Washington University
Visiting Research Professor, Survey Research Laboratory, U. of Illinois

## PROFESSIONAL SOCIETIES – MEMBERSHIPS

American Statistical Association (ASA)

## PROFESSIONAL SOCIETIES - POSITIONS

President, Research Industry Coalition, 1999-2000
Council Member, Research Industry Coalition, Representative from ASA, 1995-2000
President, Washington/Baltimore Chapter of AAPOR, 1998
Program Chair, American Association for Public Opinion Research, 1991-1992
Program Chair, Section on Survey Research Methods, ASA, 1989-90
Secretary-Treasurer, AAPOR, 1985-1986
Associate Secretary-Treasurer, AAPOR, 1984-1985
Editorial Board, Public Opinion Quarterly, 1980-1984
Editorial Board, Marketing Research, 1989-2000
Chair, Conference Committee, AAPOR, 1982-1989
Chair, Committee on Privacy and Confidentiality, ASA, 1980-1981

## PUBLICATIONS

Strumpel, Burkhard; Cowan, Charles; Juster, F. Thomas; and Schmiedeskamp, Jay; editors, Surveys of Consumers 1972-73, Contributions to Behavioral Economics, Ann Arbor: The Institute for Social Research, 1975.

Duncan, Greg, and Cowan, Charles D., "Labor Market Discrimination and Nonpecuniary Work Rewards" in Surveys of Consumers 1972-73, Contributions to Behavioral Economics, Ann Arbor: The Institute for Social Research, 1975.

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# EXHIBIT 3

Past Testimony, Charles D. Cowan

**Financial:**
MBIA v Credit Suisse. Worked for plaintiff. Deposed in January 2016. Trial in July 2019.

Christopher S. Porrino, Attorney General of New Jersey on behalf of Amy G. Kopleton, Deputy Chief of the New Jersey Bureau of Securities, v. Credit Suisse Securities (USA) LLC, Credit Suisse First Boston Mortgage Securities Corp., and DLJ Mortgage Capital, Inc., Worked for plaintiff. Deposed in November 2018.

Federal Home Loan Bank of Boston v. Nomura; Federal Home Loan Bank of Boston v. Credit Suisse Securities (USA) LLC, Credit Suisse First Boston Mortgage Securities Corp., Worked for plaintiff. Deposed in January 2019, day 1, February 2019, day 2.

Financial Guaranty Insurance Company v. Morgan Stanley ABS Capital I Inc. and Morgan Stanley Mortgage Capital Holdings LLC, as successor to Morgan Stanley Mortgage Capital Inc., Worked for plaintiff. Deposed in May 2019.

AMBAC Assurance Corporation et al v. First Franklin et al. Worked for plaintiff. Deposed in December 2019.

FDIC v. First Horizon Asset Securities et al. Worked for plaintiff. Deposed in April 2021.

AMBAC Assurance Corporation et al v. Nomura et al. Worked for plaintiff. Deposed in May 2021.

**Financial - non RMBS**
Charles Baird and Lauren Slayton, as individuals, and on behalf of all others similarly situated, and on behalf of the BlackRock Retirement Savings Plan v. BlackRock Institutional Trust Company, N.A.; BlackRock, Inc.; The BlackRock, Inc. Retirement Committee; The Investment Committee of the Retirement Committee; The Administrative Committee of the Retirement Committee; The Management Development & Compensation Committee, Catherine Bolz, Chip Castille, Paige Dickow, Daniel A. Dunay, Jeffrey A. Smith; Anne Ackerley, Amy Engel, Nancy Everett, Joseph Feliciani Jr., Ann Marie Petach, Michael Fredericks, Corin Frost, Daniel Gamba, Kevin Holt, Chris Jones, Philippe Matsumoto, John Perlowski, Andy Phillips, Kurt Schansinger, Tom Skrobe; Kathleen Nedl, Marc Comerchero, Joel Davies, John Davis, Milan Lint, Laraine McKinnon, and Mercer Investment Consulting. Worked for plaintiffs. Deposed in May 2019.

**Disparate Impact \ Discrimination:**
River Cross Land Company, LLC v. Seminole County, FL. Worked for plaintiff. Deposition, October 2019.

County of Cook v. Bank Of America Corporation. Worked for plaintiff. Deposition, February 2021.

**Construction Defects:**
Donald Melosh, et al. v. Western Pacific Housing, Inc., JAMS Case No.: 1100091610, Construction Defects. Worked for defense. Deposition, March, 2020.

**Other Cases:**
Pudlowski v. St. Louis Rams. Worked for plaintiff. Deposed in September 2017. Deposed again in October 2018.

Elena Tyurina v. Urbana Tahoe TC LLC, Urbana Tahoe Beverage Company, LLC dba Beach Retreat and Lodge Tahoe, and Action Motorsports of Tahoe, Inc. Worked for Defendant. Deposition, April 2018.

In Re: Dicamba Herbicides Litigation. Product Defect case. Worked for plaintiffs. Deposition, March 2019.

Otter Products et al, v. Phone Rehab et al. Deceptive Sales. Worked for plaintiff. Deposed in November 2019.

Thomas Allegra et al v. Luxottica Retail North America. Worked for plaintiff. Deposed in December 2019.

Westgate Resorts v. Reid Hein & Associates, dba Timeshare Exit Team. Tortious Interference case. Worked for plaintiffs. Deposition, March 2020.

Charles Copley et al Bactolac Pharmaceutical, Inc. et al. Worked for Plaintiffs, Deposed August 2020.

Mildred Clemmons et al v. Samsung Electronics of America, Inc. Worked for plaintiffs. Deposed in October 2020.

Epic Tech, LLC v. Fusion Skill, Inc. et al. Worked for defendant. Deposition in January 2021.

Jason R. Sheldon, Steven Hunsberger, et al. v. State Farm Mutual Automobile Insurance Company et al. Worked for plaintiffs. Deposition in March 2021.

Office of the Attorney General, District of Columbia v. SCF Management, LLC and Jefferson 11th Street, LLC. Worked for Plaintiff. Deposition, April 2021.

Monster Energy Company v. Vital Pharmaceuticals, Inc. and John H. Owoc. Worked for Plaintiff. Deposition, June 2021.

# EXHIBIT 4


## Sean T. Malone, Ph.D.

## Key Qualifications

Sean T. Malone is a Senior Research Associate at Analytic Focus, LLC. Analytic Focus provides consulting services for numerous public and private entities on a wide-range of topics. Dr. Malone's experience includes supporting expert testimony for litigation topics including: construction defects, discriminatory mortgage lending, housing violations, and securities. Dr. Malone has a strong background in data analysis and econometrics. His research has dealt with developing new event study measures for volatility and measuring their performance through Monte Carlo simulation; conducting fixed-income event studies; and developing and analyzing long/short equity factor investment strategies. In addition, he has coded credit default swap pricing models and conducted other empirical analyses using regression analysis, time-series models, and other statistical tools. Dr. Malone has significant scripting experience in Stata, Python, and Microsoft Excel VBA.

Prior to joining Analytic Focus, LLC, Dr. Malone taught undergraduate courses in business finance; investments; money and banking; and financial case studies at The University of Texas at San Antonio.

## Education

Ph.D., Finance, The University of Texas at San Antonio, 2019
M.S., Finance, The University of Texas at San Antonio, 2015
B.A., Financial Economics, Capital University, 2012

## Professional Experience

Senior Research Associate, Analytic Focus, LLC, 2019 to present.

## Academic Experience

Lecturer / Instructor, The University of Texas at San Antonio, 2015-2018.
Research and Teaching Assistant, The University of Texas at San Antonio, 2012-2015.

**s.malone@analyticfocus.com** 210-641-2817

## Publications

Malone, S., Kittiakarasakun, J., & Vidaurre, M. *3 Approaches for Measuring Short Squeeze Trading Damages*, Law360 (June 2, 2021), https://www.law360.com/articles/1390079/3-approaches-for-measuring-short-squeeze-trading-damages.

Cowan, A., Seguin, P., & Malone, S. T., "Event Studies in Securities Litigation," in Comprehensive Guide to Economic Damages, Sixth Edition, Business Valuation Resources, LLC, Portland, ME, 2020.

Malone, S. T. (2019). *Innovations in Financial Risk* (Doctoral dissertation, The University of Texas at San Antonio).

Roychoudhury, S., & Malone, S. T. "Were Bank CEOs Overpaid?" Journal of Business and Policy Research, 2012, 7(4), 30-39.